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## Petrography and geochemistry of Cusìn and Cubilche volcanic complexes (Interandean Valley, Ecuador)

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This study is part of a regional scale project focused on the across- and along-arc variability of the Ecuadorian magmatism. In particular, it is carried out in the frame of the well studied 50-km long NW-SE-trending transect comprising nine volcanoes (Pilavo, Yanaurcu, Chachimbiro, Chuicocha-Cotacachi, FuyaFuya, Imbabura, Mojanda and Cayambe) across the Andean Cordilleras in the North of Ecuador (0°-0°30''N) (e.g. Chiaradia et al., 2011; Béguelin et al., 2015, Samaniego et al., 2005, Robin et al., 2008, Bryant et al., 2006). The investigation of additional four volcanic edifices (Cusìn, Cubilche, Pangaladera volcanoes and Cunrru dome) carried out in this Master thesis aims to reconstruct geochemical changes of closely spaced volcanic edifices in this transect and to investigate the spatial and temporal variability of petrogenetic processes at adjacent volcanic edifices (< 7 Km). We carried out sampling and field observations on the four volcanoes, petrographic study on numerous thin sections, geochemical and isotopic analysis on the whole rocks (XRF, Laser Ablation ICPMS, radiogenic isotope of Pb, Nd and Sr), in situ mineral analysis (major elements microprobe analysis on plagioclase and pyroxene) and geochronology ($^{40}Ar/^{39}Ar$). The study of these volcanoes and of their xenoliths has also provided data that could improve the understanding of the lithological nature of the basement in the Interandean Valley (continental or oceanic crust?), which is poorly known because covered by Tertiary to Quaternary volcanic and volcanoclastic deposits.

Results of this study show that Cusìn magmatic rocks are more evolved, enriched in incompatible elements and isotopically more crustal than those of the other three volcanic edifices investigated. The more evolved isotopic signature suggests a more significant crustal assimilation in the magma reservoir of Cusìn or of a transition from less to more radiogenic basement rocks (transition from the oceanic to the continental basement). We have carried out Monte Carlo simulations of assimilation and crystal fractionation (ACF) processes using the REE geochemistry of the volcanic rocks and appropriate parent and assimilant reservoirs. REE spectra of Cusìn volcano need at least 30% of assimilation (r= 0.3 = mass of assimilated material/ mass of the initial magma) of a mid-crust reservoir and 34± ± 9% of fractionation to be reproduced by the model. On the other hand REE spectra of Cubilche require near zero assimilation (r = 0.05 ±± 0.04) and a lower amount of crystal fractionation (F = 18 ±± 4%). The new data acquired in this study have also allowed us to refine and increase the spatial resolution of geochemical and isotopic compositions for the NW-SE trending across-arc transect above mentioned. This now densely "populated" transect (13 volcanoes) displays regular increase in Sr isotopic ratio from the frontal arc towards the back-arc. In contrast major and trace elements do not always show systematic changes along the transect. We conclude that geochemical changes depend on peculiar localized magmatic evolutions of each single volcanic center whereas the systematic changes of radiogenic isotopes across the transect are related to the nature of the basement (oceanic towards the trench and continental towards the back-arc) and to the amount of assimilated material in the magma reservoirs.

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